FOREST PRODUCTS
Project Fact Sheet

ON-LINE FLUIDICS CONTROLLED HEADBOX WITH COANDA JET

BENEFITS

- Adds value to the product by minimizing problems arising from dimensional instability such as curl and cockle
- Increases the paper's tensile stiffness and toughness, strengthening the product
- Reduces the amount of fiber used in the product
- Reduces product rejects due to sub-standard quality
- Saves about $2 million annually in fiber-usage costs in a single, medium-sized machine
- Reduces use of water and energy
- Increases mill productivity

APPLICATIONS

During the third year of the research, and after pilot testing, the technology will be transferred to industry by implementation in a commercial machine. The technology is expected to be a retrofit to existing paper machines.

New Technology Will Produce an Isotropic Sheet at Commercial Machine Speeds

With knowledge of fluid dynamics, it is possible to control the orientation of fibers when the pulp slurry leaves the headbox and enters the forming section of paper-making machines. Researchers have learned that by applying a regular pattern of pressure pulses in the headbox tube block, upstream of where the fluid enters the forming section, they can control the flow of the fluid (slurry) rather than allowing it to expand and fluctuate randomly under the rules of fluid dynamics. By controlling the flow of the slurry, they can also control fiber orientation within the slurry. A specific axial vorticity inside the headbox tubes is coupled with an automatic on-line control system to regulate the interaction between the turbulent flow and the fiber suspension. This improves the structural formation of the sheet and creates a better paper product.

The new on-line control method has been demonstrated in the laboratory, but further work is needed to develop the technology for implementation in the forming section of a paper machine. Proper fiber alignment increases the properties of stiffness and toughness in paper products, and eliminates variability in their physical properties. Development of this technology will lead to fewer rejects, increased productivity, and significantly reduced costs for fiber, water, and energy for the pulp and paper industry.

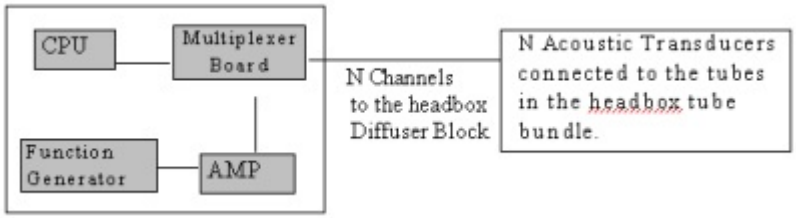

Figure 1. Schematic diagram of the experimental system.

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PROJECT DESCRIPTION

Goal: To replace the current headbox with an on-line, controlled, hydrodynamic system for uniform dispersion and distribution of fibers on the moving wire.

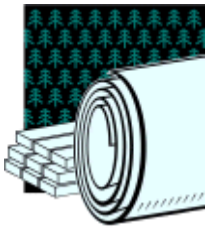
The project will be divided into three phases, each to occupy one year of research effort:

Phase I. Laboratory Experiments-Generate and control axial vorticity in a tube bundle.
Phase II. Pilot Trials-Implement and conduct trials of the pilot machine (in collaboration with industry).
Phase III. Commercial Trials-Commercially

On-line hydrodynamic control devices (with no moving parts) will be developed to control and optimize the frequency and pattern of the fluid flow and therefore the fiber orientation. This will be based on the "Fluidics-Controlled Coanda Jet concept" invented and demonstrated in a laboratory tube by the Institute of Paper Science and Technology. The experiments will proceed from a single tube to multiple jets and perhaps to another system that replaces the tubes entirely. Pilot trials will be conducted in paper mills and commercialization will be implemented during the third year of this project.

PROGRESS & MILESTONES

- Researchers have identified the basic hydrodynamic characteristics in the forming process that produce sheets of paper with isotropic fiber orientation.
- The new technique has been demonstrated in a static form at commercial speeds.
- Laboratory experiments are underway to further develop the technology for on-line, automatically adjustable control of the forming process.



PROJECT PARTNERS
Institute of Paper Science and Technology
Atlanta, GA

Beloit Corporation R&D

ABB Industrial Systems, Inc.
Houston, TX

FOR ADDITIONAL INFORMATION PLEASE CONTACT:

Eric Lightner
Office of Industrial Technologies
Phone: (202) 586-8130
Fax: (202) 586-1658
e-mail: eric.lightner@ee.doe.gov

Dr. Cyrus K. Aidun
Institute of Paper Science and Technology
500 10th Street, N.W.
Atlanta, GA 30318
Phone: (404) 894-6645
Fax: (404) 894-1496
e-mail: cyrus.aidun@ipst.edu

Please send any comments, questions, or suggestions to webmaster.eren@nrel.gov

Office of Industrial Technologies
Energy Efficiency and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585

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